

### ABSTRACT

A method and apparatus are disclosed for evaluating relatively small periodic structures formed on semiconductor samples. In this approach, a light source generates a probe beam which is directed to the sample. In one preferred embodiment, an incoherent  
5 light source is used. A lens is used to focus the probe beam on the sample in a manner so that rays within the probe beam create a spread of angles of incidence. The size of the probe beam spot on the sample is larger than the spacing between the features of the periodic structure so some of the light is scattered from the structure. A detector is provided for monitoring the reflected and scattered light. The detector includes multiple  
10 detector elements arranged so that multiple output signals are generated simultaneously and correspond to multiple angles of incidence. The output signals are supplied to a processor which analyzes the signals according to a scattering model which permits evaluation of the geometry of the periodic structure. In one embodiment, the sample is scanned with respect to the probe beam and output signals are generated as a function of  
15 position of the probe beam spot.